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MISSISSIPPI IMPROVEMENTS AND TRAFFIC PROSPECTS.

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The execution of the proposed improvements and extensions of the waterways of the Mississippi Valley will necessitate eventually the expenditure of hundreds of millions of dollars. To determine whether such an expenditure will be warranted, it is necessary to examine the problems involved in the undertakings, the cost of the improvements and their values as determined from an estimate of the lands reclaimed, freight rates saved and traffic secured.

Problems of River Regulation

In presenting the results of such an inquiry, a general discussion of the present obstacles to the free navigation of the Mississippi and the agencies which will assist in the improvement of the river, irrespective of the great projects now proposed, will precede the detailed study of the particular sections of the river.

Thus far, the frequent shifting of its channels, the sappings of its banks, the building of bars, the setting of snags and sawyers, the destruction of landings by the changing elevations of the water, and the interference of levees, bridges and other engineering works, have checked all efforts to increase the river traffic to meet the general industrial growth of the Mississippi Valley.

Each year an average of four hundred million tons of sediment is carried down to the gulf, occasioning great difficulties in controlling the stream. Bars are formed by the silt; and, by the deposition of the coarser débris, the river's course is dammed. The floating sediment scours the channel and wears away the obstructing banks with any acceleration in the current of the stream. As much of this sediment comes from the headwaters of each of the tributaries of the Mississippi, the main river can never be cleared until adequate provision is made for clearing

these tributaries. The sediment-free streams can then be made tractable for navigation and their power convertible for industrial purposes.

In the effort to clear the Mississippi the establishment of forest reserves and national parks will also be helpful. The forests, by conserving the rainfall, will check the tendency of the mountain streams to gather in torrents and carry into the headwaters of the tributaries vast quantities of sediment. Even the fringe of willows or beds of cottonwoods along each smaller stream will aid much if the local authorities will encourage their retention.

The municipal system of waterworks can be made, to a greater extent, a part of the general plan for clearing the river and improving the navigation. Each waterworks reservoir is a settling basin and the control of the catchment area checks soil wash and minimizes the amount of sediment carried by the stream. A definite and comprehensive system of co-operation between the national and municipal governments in the furtherance of every system of waterworks is yet to be established.

As more people see how irrigation incidentally reduces storm-floods and thaw freshets and retains much of the contained sediments, there will be a fuller appreciation of the fact that the irrigating and reclamation of the western lands will do much in bringing under control portions of the Mississippi river system. The above shows how important it is even from the standpoint of navigation, to adopt, as suggested by President Roosevelt in his recent Memphis speech, "a single comprehensive scheme for meeting all the demands so far as possible at the same time and by the same means."

In the endeavor to protect the flood plains the close connection which the improvement of one section of the river bears to that of another is very evident. The lower Mississippi during the period of its early settlement occasionally shifted its channel and, running over broad bottom lands, fixed in time its position by building natural levees of silt. Then again it broke through these barriers.

With the increase in population in the upper basin of the river and the reckless practice pursued of destroying the belts of timberlands along the rivers and running the furrows down slope regardless of soil wash, the quantity of sediment in the lower

river was augmented, the clogging of the channels was hastened, and the devastation by floods increased. In order to protect the millions of fertile acres of cane, corn and cotton the levee system was inaugurated. Upon this millions have been spent until now, in 1907, about 75 per cent of the banks of the river south of Cape Girardeau are leveed.¹

The Mississippi River Commission, in their report of 1906, recommended the completion of the levee system. There are, however, some general difficulties involved in the work. As the waters of the river are confined within narrower limits, a vertical expansion of the water must occur. Therefore the levees must always exceed in height by two to four feet the highest known elevations of the waters. It is always possible that the next flood may be higher than any previous one. Some engineers tell us that if the river be contracted between rigid walls, the velocity of the stream will be so increased that up-stream navigation will be impossible and down-stream dangerous.² Others maintain that the sand bars and the sinuosity of the river are nature's provision against the violence of the stream.

Improvement Authorized in River and Harbor Bill, 1907

Three lines of procedure for the improvement of the Mississippi are designated in the recently passed River and Harbor Bill:³

(1) Appropriations were voted for the general improvements of the river, for the extension of the levee system and the improvement of navigation. This includes the maintenance of a navigable channel for at least 200 feet in width and 9 feet in depth from Cairo to the gulf.

(2) Appropriations for the improvement of the river from the mouth of the Ohio to the mouth of the Missouri.

(3) The appointment of a board to report on the practicability and desirability of constructing a navigable channel fourteen feet deep and of suitable width from St. Louis to the gulf either by the improvement of the river or by a canal or canals for a part of the route.

For study the river may be divided into three sections: (1)

¹Chief of Engineers' Report, 1906, Pt. II, 2485, states that nearly 4,960 miles of levees had been built up to May 1, 1906.

²Cong. Records, p. 2168.

³H. R. Bill 24,991.

The lower Mississippi northward to the mouth of the Ohio; (2) The middle section, from Cairo to the mouth of the Missouri;⁴ (3) The upper Mississippi, north of the Missouri.

The Lower Mississippi—The Levees

In the lower Mississippi navigation is impeded by shifting channels, destruction of the banks and the deposition of snags and sediments. The results obtained from dredging have fully established the fact that it is entirely feasible to maintain a channel 9 feet in depth and at least 250 feet wide at all stages by means of a suitable equipment of dredges. Success, however, rests upon an uninterrupted prosecution of the work which can only be secured by the government's continually appropriating the necessary funds. To secure the confidence of the capitalist who must provide the money for building the river craft and the steamboat man who navigates, an adequate channel must be maintained for a period of years.

In the reclamation of the valuable lowlands much levee work remains to be done, as was demonstrated by the flood of 1903. One-fourth of the Yazoo basin was under water, one-half of the City of Greenville, Mississippi, inundated, six thousand people driven from their homes and traffic suspended on the Yazoo and Mississippi Valley Railroad for twenty days, and on the Riverside Division for forty.⁵ As the levee grows in volume, the loss per mile from the carrying away of its banks becomes more and more serious and, if the same rate of destruction continues,⁶ the time will come when the annual revenues will not be sufficient to build new levees to replace those that cave in. It will, therefore, be necessary to continue the appropriations at an increased ratio for a number of years. The caving of the levee banks occurs in the bends, and the action takes place at intervals. The damage can be stopped only by revetment or by building a new levee on ground further from the river. The first method is so expensive that it is not favored by the commission except in a few cases: when the levee threatened is so situated that a new location cannot be formed except at a great distance from the river, where extremely valuable

⁴Twenty-eight miles north of St. Louis.

⁵Miss. River Com. Report, 1904, p. 23.

⁶Since Dec., 1903, 17 per cent of the total length of controlling line has been abandoned. Cong. Records, 41, Pt. 3, 2385.

interests would be sacrificed by the changed line, where there is a lake, an impassable swamp or a town lying immediately behind the present levee which would be thrown open to the flow by the change.⁷

To prevent the bends being cut off is another object of revetment. The importance of this phase of the work is seen in the disastrous effect of a cut-off where the bend is, say, fifteen miles around and one mile across. As the fall in the river is about six inches in a mile we would have, where the cut-off is made, a fall of seven and one-half feet in a mile, disturbing the existing conditions for forty to fifty miles above and below. Experience has shown that this shortening would be only temporary as the river would begin to eat in the offshore and in a very few years the length of the cut-off would be reached. This makes it imperative that both shores shall be protected.

But the higher levees, required for the confinement of the flood discharges from Cairo downward, will necessitate the expenditure of an amount of money which will be more and more beyond the ability of the riparian communities to bear. Although it now costs about \$200,000 a mile for revetment work, it is estimated that if the government would undertake energetically, on a large scale, the revetment of the uncompleted portions of the five hundred miles of caving banks from Cairo to the mouth of the Red River, it would cost less than fifty million dollars. This completed, less money would have to be spent in dredging.

There is yet much work to be done in the New Orleans Harbor. Here an ever-present danger of a sudden collapse in certain portions exists. Ample funds must be provided for the extension and completion of the revetment.

The Middle Section of the River

For the middle section of the Mississippi River, the plan of 1881 arranged for the confinement of the flow to a single channel, having approximately a width of 2,500 feet below St. Louis. The secondary channels were to be closed and new banks built out where the natural width was excessive. For this purpose permeable dikes or hurdles of piling were to be used to collect and hold the solid matter that is carried in suspension or rolled on the bottom

⁷Cong. Records, 41, Pt. 3, 2385.

of the river.⁸ In 1896 the plan was modified by substituting dredging as the method of clearing the channel, and by 1903 dredging plants were established.⁹

In the River and Harbor Bill, as passed, only \$250,000 was voted for the work in this section of the river. Mayor Burr and others state that it will take all of that amount to keep the dredges going with nothing left for levee or revetment work.¹⁰ The sum of \$650,000, as recommended by General Mackenzie, Chief of Engineers, as the amount to be expended for the fiscal year ending June 30, 1908, was plead for in both houses of congress, but was rejected by the Committee on Rivers and Harbors of the lower House.

The objections to the larger appropriations were stated by Chairman Burton¹¹ of the House Committee on Rivers and Harbors. They were: (1) More money had been spent on the Mississippi River within the last twenty years per annum than is expended by Germany on the Rhine, whose traffic is thirty to forty million tons a year, while the total traffic of the middle section of the Mississippi dropped from 1,260,000 tons to 440,000 tons in the last ten years. (2) Extensive plans of improvements were adopted in 1881 at an estimated cost of \$16,000,000. This proved ineffectual. After twenty-three years nearly eleven millions had been expended, when the estimate for the completion of the work was given as twenty millions, four millions more than the original estimate. (3) For nearly three years there have been eight feet of water, the amount now sought, yet traffic is diminishing. For the year 1904 and the three years previous \$650,000 a year was provided. (4) Freight rate from St. Louis to New Orleans on grain is only one-third more per ton mile to-day than it is from Duluth to Buffalo. With this low rate practically no grain is shipped from St. Louis to New Orleans.¹² (5) Until it was determined whether or not the proposed deep-water channel from Chicago to the gulf necessitated canalization along the middle section of the river, it was unwise to expend more money for the section.¹³

⁸Engineer's Report, 1906, Pt. I, 462.

⁹Engineer's Report, 1904, 2144, *et seq.*

¹⁰Cong. Records, 41, Pt. 5, 4095.

¹¹They were stated in the House, reiterated in the conference with the Senate Committee and re-stated before the Senate by Senator Frye Feb. 27, 1907. See Cong. Rec., 41, Pt. 5, 4088.

¹²Cong. Records, 41, 2429 (Feb. 11, 1907).

¹³*Ibid.*

Lakes to Gulf Waterway

Closely associated with the improvement of the middle section are the projects for the fourteen-foot deep-water channels from Chicago to St. Louis and thence to the gulf. Chicago, having completed the drainage canal with a view to its navigation, desires to secure its utmost efficiency by inducing the general government to complete a deep-water channel to St. Louis. United States surveyors have estimated the cost of a fourteen-foot waterway from Lockport, the terminus of the drainage canal, to the mouth of the Illinois River as a little over 23½ million dollars.¹⁴ The Illinois law providing for the drainage canal, stated that whenever the United States Government shall improve the Des Plaines and Illinois rivers, making them capable of receiving a flow of 600,000 cubic feet per minute and assume all damages arising from any extra flow above 300,000 cubic feet per minute, the drainage canal shall be likewise enlarged and turned over to the general government for navigable purposes.

Certain difficulties are to be noted in the plan for the general government's undertaking the project. At a recent meeting of the Rivers and Harbors Committee at Niagara Falls, both the president and chief engineer of the sanitary district board stated that to carry off the sewerage of Chicago, a flow of 840,000 cubic feet per minute would be required.¹⁵ In 1905-06, when the flow from the drainage canal was but 250,000 cubic feet per minute, 224 lawsuits were brought against the trustees of the sanitary district of Chicago and damages claimed amounting to \$4,409,180. What damages the government will have to assume when the necessary 840,000 feet of water is turned in, is not known.¹⁶

How the level of the Great Lakes will be affected by this flow, is another problem. The enormous expense then of dredging the lakes can only be avoided and their present level maintained, by placing dams and other controlling works across the Detroit and Niagara rivers. This can be done only at great expense and after an international agreement.

Important water rights have been developed along the route

¹⁴Report upon Survey of Des Plaines and Illinois Rivers, 1905, p. 19. House Doc. 263, Fifty-ninth Cong., First Session.

¹⁵Cong. Rec., 41, p. 2299.

¹⁶Report upon Survey of Des Plaines and Illinois Rivers, 1905, p. 12. See also Cong. Rec. 41, p. 2299.

of the proposed deep-water channel by private corporations. In furthering the plans for the improvement of the rivers for navigation, it is necessary to cause the relinquishment of these rights. The State of Illinois is at present meeting with considerable opposition in its endeavor to remove the dams which obstruct the work upon the portion of the deep-water channel in which the state is interested.

The deep-water project from Chicago to the Mississippi will necessitate the enlargement and deepening of the channel from Grafton to St. Louis, or else the building of a lateral canal connecting these points. Engineers are not yet agreed as to the practicability of the canalization of the Mississippi. The Committee on Rivers and Harbors was undoubtedly wise in holding up the work to await the development of other projects and to give the engineers time to study the problems further in the hope of a closer approach of unity in the recommendations.

The Reservoirs of the Upper River

The upper Mississippi has certain unique projects. The principal one is the construction of reservoirs at the headwaters of the river, between Brainerd and Grand Rapids, Minnesota. These are planned to collect the surplus water from precipitation of the winter, spring and early summer to be systematically released during the navigable season so as to benefit the navigation of the river below.

A present difficulty in the efficient management of the reservoir system, as now constructed, is the great distance of the reservoirs from the head of navigation at St. Paul. Trouble arises in getting the water down to St. Paul in time to make good a sudden decrease in the natural flow at that point. To remedy this, use is made of the small available supplies in Sandy Lake and Pine River. To secure a much larger supply, which is needed, it is proposed to build other reservoirs which will deliver to St. Paul several billion more cubic feet of water from a point 103 miles nearer.¹⁷

The reservoirs affect seven different interests which often conflict; the steamboat navigation below and above St. Paul, logging, mills at and above Minneapolis, riparian owners on the river

¹⁷Engineer's Report, 1906, Pt. II, p. 1438.

and those on the reservoirs. Each is unquestionably better off with than without the reservoirs; in fact the supply and regulation of water secured by the system greatly benefit the 434 miles of navigable river between Minneapolis and Cass Lake.

The different interests affected by the reservoir system selfishly desire it to be managed exclusively for their own benefit. Owing to this fact the consideration and settlement of the various complaints against the system constitute at present a problem in the improvement of the upper Mississippi. These complaints came from three sources: (1) Riparian interests above the dam; (2) the flooded district in the vicinity of Aitkin, Minnesota; (3) the milling interest at Grand Rapids, Minnesota.

Of the first, it may be said that the reservoir system does flood the lands, and the fluctuation in the water surface thus occasioned results in damage. Consequently, the government must acquire the land overflowed, purchase the right to overflow it, or pay damages for property destroyed. In acquiring the right to overflow the land, the government is performing its full duty in the matter.

In extending and completing the reservoir system, the government came into dispute with the Indians in the Leach Lake Reservations. These Indians have resorted to growing wild rice and hay around the reservoirs. Although the government paid them \$150,000¹⁸ for the right to overflow their land, a fair compensation, they, naturally improvident, continue to depend on additional government aid.

Besides the complaints of the Indians, dissatisfaction has arisen among those financially interested in the lumber company at Cass Lake. The J. Neils Lumber Company, organized after the United States Government had secured the flowage rights on the lands occupied by the company's mills, feel entitled to damages by the overflow because they were not notified of the government's right when they bought the land. Though complaints come to the engineering board from other localities, the government seems to be adjusting equitably every legitimate outstanding claim.

A general demand to abandon the reservoir system comes from those impressed by the loss occasioned by the withdrawal of the land from settlement and the permanent obstacle to its development.

¹⁸Act Aug. 19, 1900.

However, the benefits to the various interests below the dam are so great that, even if the flowage lands above were vacated by the government, the advantages to the community at large could never be so important as those secured by the reservoirs.¹⁹

A few words regarding the situation at Aitkin, Minnesota, will aid in understanding the problems met in the improvement of the river at that point. Owing to the low banks, flat slope and excessive curvature of the Mississippi in this section a very fertile area of 100,000 acres is subject to overflow. The flood of 1905 caused an actual damage of \$50,000 and such dire indirect losses that the government of Minnesota called for relief contributions. A number of farms were abandoned and the crops for an entire season over a large tract of country were destroyed. The people of Aitkin, rejecting the engineer board's statement that the cause was the exceptional rainfall, firmly believe that the reservoir system occasioned the disasters. Hence the engineer board must now convince the people²⁰ of the real cause and make all possible alterations in the system to appease them.

The great paper industry of Grand Rapids, Minnesota, with its mills about two and one-half miles below the Pokegama reservoir dam, complain of insufficient water to run during the non-navigation seasons. It appears that the company located its mills and constructed its mill wheels with the view of taking advantage of the reservoir system. But now it is found that the requirements for navigation, the main purpose of the system, do not always coincide with those of the mill. The whole contention of the paper company amounts to this: that the government shall abandon the purposes for which the reservoirs were built and convert them into mill ponds, for the benefit of the company. In this clash it is clearly shown that the interests above the dams can never be equally as well served as those below. The lower interests are much more important and must take the precedent. However, to secure the largest amount of support for its method of improving the upper river, the government must do all in its power to treat the paper industry with the utmost liberality. This it seems to be doing, although at present obliged to reject the radical demands of the Grand Rapids interests.

¹⁹See Engineer's Report, 1906, Pt. II, 1464-70.

²⁰See Engineer's Report, 1906, Pt. II, 1459-64 for careful examination of the question.

The River from St. Paul to St. Louis

From St. Paul to the mouth of the Missouri River, the improvements consist of the removal of snags, some dredging and such special harbor and levee work as is needed. Originally the channel between these two points was such that in low stages the larger boats were unable to proceed farther up stream than La Crosse or Winona. The present project for the improvement of this section proposes a contraction of the waterway so as to afford a channel of sufficient width and a depth of four and one-half feet at low water, to be eventually increased to six feet by further contraction. For the last few years such a channel has been secured. Expenditures are still demanded in order to obtain an increased depth at certain points and make the necessary repairs to dams and shore protections.

It has now become the fixed policy of the Committee on Rivers and Harbors to recommend no appropriations for the improvement of any waterway until the tonnage of the section shows sufficient magnitude. Furthermore, there must exist reasonable grounds for expecting that such an amount of the tonnage will follow the waterway as to make the business returns therefrom commensurate with the expenditure for the improvement.

Water Power—Upper River

Thus far, the advantages derived above St. Paul from the reservoirs have been largely such as accrue to the floating of logs.²¹ In time the logging interests will relinquish the river to navigation and large quantities of merchandise will be transported to market from the upper regions which are not reached by railroads. With the completion of the locks and dams now being built, Minneapolis will become practically the head of navigation on the river.

The storage capacity of the five reservoirs, constructed and maintained by the government at a cost of \$1,250,000, is 96 billion cubic feet of water. It is estimated that each billion cubic feet is at present worth to the milling interests of Minnesota \$13,000 a year or a total of \$1,218,000. The total valuation of water-power development in operation on the Mississippi between Minne-

²¹Traffic between Grand Rapids and Brainerd, Minn., in 1905, was 460 tons of freight and 1,586,000 tons of logs, valued at \$5,436,000. Engineer's Report, 1906, 11, 1440.

apolis and the reservoirs is now about \$225,000. Additional powers worth \$900,000 are being built about Minneapolis while others amounting to nearly \$3,000,000 are under consideration. It is maintained that the reservoir system has already directly benefited the milling interests of Minneapolis to the extent of \$500,000; for, here over 16,000,000 barrels of flour are produced yearly by water power at less than one cent a barrel, while by steam it would cost five cents.²²

River Traffic and Rates above St. Louis

For the year 1905, 4,089,319 tons of freight passed between St. Paul and the mouth of the Missouri River.²³ Up to June 30, 1906, the government had spent \$11,673,356.76 on improving this portion of the river, and \$660,000 for maintaining the improvements.²⁴ At first sight the expense might appear entirely out of proportion to the traffic, but, by the great saving in freight rates, the expenditure was well made.

In 1905, the railroads on both banks of the river from St. Louis to St. Paul charged 50 per cent more than the steamboats; while the railroad rate to an inland point, having no water competition, but about the same distance from St. Louis, was 200 per cent higher.²⁵ There can no longer be any doubt that water rates have a controlling influence upon railroad rates. Abundant proof of this is given in the table on page 158.²⁶

It is difficult to overestimate the vast possibilities for manufacturing industries in the upper Mississippi Valley. Wisconsin alone with its 1,400 lakes and rivers represents immense potential power. This power, conserved and increased, will vastly augment the amount of manufactured merchandise which must seek exportation.

One may reasonably doubt the assertion of Governor Van Sant, of Minnesota, made in 1904, to the effect that with a six-foot stage in low water, practically all the flour for export in Minneapolis will find an outlet down the Mississippi to the gulf.²⁷ The average freight rate on wheat from New Orleans to Liverpool for

²²Engineer's Report, 1906, II, 1470.

²³*Ibid.* I, 465.

²⁴*Ibid.*

²⁵*Ibid.* 466.

²⁶Report of the Upper Mississippi River Association, 1905, p. 167. See similar table in Report, 1902.

²⁷Proceedings of Upper Mississippi River Improvement Association, 1904, p. 49.

FREIGHT RATES SHOWING COMPARATIVE BASIS BETWEEN POINTS HAVING WATER COMPETITION AND INLAND POINTS WHICH DO NOT OBTAIN THE BENEFIT OF WATER RATES.

FROM	TO	Miles.	Route.	CLASSES.				
				1	2	3	4	5
St. Louis ...	St. Paul, Minn.	573	Rail	\$0.63	\$0.52 1/4	\$0.42	\$0.26	\$0.21
St. Louis ...	St. Paul, Minn.	729	Boat	.40	.34	.27	.17	.14
St. Louis ...	Oklahoma City, O. T.	543	Rail	1.30	1.09	.97	.84	.67
St. Louis ...	Dubuque, Iowa.	340	Rail	.45	.37	.29	.23	.18
St. Louis ...	Dubuque, Iowa.	439	Boat	.33	.26	.20	.15	.10
St. Louis ...	Topeka, Kas.	347	Rail	.89	.69	.54	.42	.32
St. Louis ...	Quincy, Ill.	140	Rail	.32	.27	.21	.15	.10
St. Louis ...	Quincy, Ill.	161	Boat	.26	.22	.17	.12	.08
St. Louis ...	Moberly, Mo.	148	Rail	.50	.39	.29	.23	.18
St. Louis ...	Hannibal, Mo.	120	Rail	.30	.25	.19	.14	.09 1/2
St. Louis ...	Hannibal, Mo.	141	Boat	.23	.18	.14	.10	.07
St. Louis ...	Mexico, Mo.	110	Rail	.43	.34 1/4	.26	.21	.16
St. Louis ...	Burlington, Iowa.	214	Rail	.44	.35	.26	.18	.12
St. Louis ...	Burlington, Iowa.	249	Boat	.33	.26	.20	.13 1/2	.09
Quincy, Ill. ...	Kansas City, Mo.	226	Rail	.60	.45	.35	.27	.22
St. Louis ...	Peoria, Ill.	165	Rail	.25	.20	.16	.12	.11
St. Louis ...	Poplar Bluff, Mo.	166	Rail	.52	.44	.36	.31	.26
St. Louis ...	Cape Girardeau, Mo. .	131	Rail	.25	.20	.15	.12 1/2	.12 1/2
St. Louis ...	Salem, Mo.	127	Rail	.46	.39	.32	.28	.23
St. Louis ...	Memphis, Tenn.	305	Rail	.65	.50	.45	.35	.30
St. Louis ...	Hickory Valley, Tenn.	302	Rail	.96	.82	.67	.55	.45
St. Louis ...	New Orleans, La.	705	Rail	.90	.75	.65	.50	.40
St. Louis ...	Terrell, Texas.	669	Rail	1.37	1.21	1.04	.96	.75
New York ...	Chicago.	913	Rail	.75	.65	.50	.35	.25
Chicago ...	New Orleans.	923	Rail	1.10	.90	.76	.58	.47
Chicago ...	Kansas City.	458	Rail	.80	.65	.45	.32	.27
New York ...	Chicago (Lake and Rail) ....	.....	.....	.59	.51	.40	.29	.25

the years 1899-03, inclusive, was 6.55 cents per bushel, while from New York it was only 3.97 cents.²⁸ In 1905 the rate for flour from New Orleans to Liverpool was 15 cents per hundred pounds, while from New York it was 5.63 cents.²⁹

The grain and flour required in the internal trade of the Mississippi would seek the improved waterway. In addition there would be an up-stream traffic in lumber, sugar, molasses, rice and imports from Asia and South America. The hardwood lumber in such demand in the furniture factories in the Middle West could be transported on the river.

The claim that coal will be brought down the Ohio and up the Mississippi can be believed; that it will be carried clear to St.

²⁸Digest of Hearings on Regulation of Railway Rates, Senate Doc. No. 244, Fifty-ninth Congress, First Session, p. 498, 493.

²⁹*Ibid.*, 498, 501.

Paul and Minneapolis, may be doubted. A greater amount of this coal could reach Wisconsin and Minnesota towns by the improved waterways. The problem of coal transportation is always complicated by the fact that railroads will often carry coal to the distant Northwest at a great sacrifice in order to secure a return cargo. At present it is hauled from Ashtabula, Ohio, to Duluth by water at the rate of thirty-five cents a ton so as to secure a return cargo for the iron ore vessels.

In spite of all the statistics of the traffic upon the upper Mississippi, no great amount of actual commerce is shown. As yet this section of the river does not have the amount naturally belonging to it. To some extent this is due to the uncertainty of its navigation, making it impossible to induce capital to build the necessary steam crafts. Commerce did not come to the railroads until they were completed, and it will not come to the river until the improvements are made.

Traffic Below St. Louis

The tables on page 160 give the statistics regarding the traffic on the middle and lower section of the river:

For the fiscal year ending June 30, 1904, the three great railroads between Chicago and St. Louis transported 449,115 tons of freight to St. Louis and returned with 633,182 tons, making a total of 1,082,297 tons in both directions.⁸⁰ Though far short of the amount moved in 1906, this indicates, to some extent, what a share the projected deep waterway to St. Louis might have in the traffic. The meats, cereals, hardy fruits, manufactured merchandise made from iron and steel, and the furniture of the Middle West will seek the new route in reaching the southern states. In return the tobacco, rice, nuts, and lumber will be sent to the north. All non-perishable goods of small money value in proportion to their weight will go by water rather than by rail. Then, too, the waterway can carry the raw materials for building and manufacturing purposes which a more costly means of conveying would leave untouched.

With the completion of the deep waterway from the lakes to the gulf, the Lake Michigan traffic would have a route to the

⁸⁰Engineer's Report of Survey of Des Plaines and Illinois Rivers. House Doc. 2, 63, Fifty-Ninth Congress, First Session (1905-06), 15.

COMMERCIAL STATISTICS FOR CALENDAR YEAR 1905.³¹

[Report of the Chief of Engineers, U. S. Army.]

TABLE I.

TONNAGE BETWEEN—	Number of passengers.	RECEIPTS AND SHIPMENTS, IN TONS.					
		Grain and its products.	Cotton.	Cotton seed and its products.	Live stock.	Coal and coke.	Lumber.
St. Louis and Cairo	61,232	50,441	1,991	912	21,048	131,756	21,143
Cairo and Memphis	41,606	51,123	9,573	11,060	200	1,328,930	242,076
Memphis and Vicksburg	114,179	47,960	66,556	64,699	4,091	1,097,758	128,697
Vicksburg and New Orleans	84,225	26,881	25,349	39,554	3,945	1,080,075	33,203

TONNAGE BETWEEN—	RECEIPTS AND SHIPMENTS, IN TONS.					
	Logs.	Iron, steel and metals.	Groceries and provisions.	Stone, sand and gravel.	Miscellaneous and unclassified.	Total.
St. Louis and Cairo	101,111	135	18,958	.....	69,526	417,021
Cairo and Memphis	486,051	55,153	4,844	5,800	43,550	2,238,363
Memphis and Vicksburg	334,499	16,499	30,471	1,336	45,354	1,855,830
Vicksburg and New Orleans	233,388	24,062	86,833	529,852	†382,932	2,462,974

*Includes 4,742 tons of oil.

† Includes 259,296 tons of oil.

NOTE.—Each stretch is treated as a separate river, and tonnage carried between ports on different stretches will appear in the statistics of all intervening stretches. Consequently the sum of the tonnage carried in the four stretches does not represent the total traffic on the river as a whole.

TABLE II.—RECEIPTS AND SHIPMENTS AT PRINCIPAL PORTS.

PORTS.	Passengers carried in and out of port.	RECEIPTS AND SHIPMENTS, IN TONS.					
		Grain and its products.	Cotton.	Cotton seed and its products.	Live stock.	Coal and coke.	Lumber.
St. Louis, Mo.	*961,618	24,497	1,991	855	21,017	125,755	21,132
Memphis, Tenn.	73,744	12,362	26,724	18,786	2,217	132,410	18,067
Vicksburg, Miss.	60,583	35,889	42,158	47,665	719	53,803	14,414
New Orleans, La. †	21,967	733,866	583,990	399,147	7,522	1,053,204	345,100

PORTS.	RECEIPTS AND SHIPMENTS, IN TONS.					
	Logs.	Iron, steel and metals.	Groceries and provisions.	Stone, sand and gravel.	Miscellaneous and unclassified.	Total.
St. Louis, Mo.	64,323	135	17,146	7,000	86,574	370,425
Memphis, Tenn.	200,800	989	10,044	.....	61,637	484,045
Vicksburg, Miss. †	72,500	33	13,865	3,000	15,593	299,669
New Orleans, La. ‡	298,858	78,836	794,946	6,756	§802,513	5,104,798

* Includes 832,500 passengers in local excursion traffic.

† The traffic with the Yazoo River and its tributaries not included.

‡ Includes exports and imports and the domestic coastwise traffic as far as reported.

§ Includes 262,793 tons of oil.

³¹Engineer's Report, 1906, II, 2514.

ocean closed only 22 per cent of the twelve months in the place of the present waterway which is blocked with ice 40 per cent of the year. The wholesale merchants are practically barred, by the prohibitory railroad freight rates, from the territory south of the Ohio River both east and west of the Mississippi. The coming improvements of the Ohio, Cumberland, Tennessee, Red and Arkansas rivers will open the entire South to the northern trade.

With an improved Mississippi and the deep-water channel made to Chicago, a lively contest may be waged as to which route the grain from St. Louis will take for exportation to Liverpool. The average rate charged for the years 1899-1903, inclusive, from St. Louis to Liverpool via New Orleans, was 10.99 cents³² and via New York it was 16.33 cents.³³ For the same period the rate from Chicago to Liverpool via the lakes and the Erie Canal was 9.15 cents.³⁴ If the improved Mississippi will make a corresponding reduction in the rate via New Orleans that the deep waterway will occasion via New York, grain will continue to go to New Orleans from the St. Louis market. In 1905, the flour rate from Kansas City to Liverpool via New York, rail, lake and canal, was 30.24 cents per 100 pounds, while it was only 26.15 cents via New Orleans.³⁵ With an improved Missouri, Mississippi and the deep-water channel to Chicago the grain from Kansas City might have a choice of two routes.

Upon the completion of the Panama Canal there will be a vast increase in the traffic moving southward to the gulf. With the deepened upper Mississippi, the channel connecting the Mississippi with the Great Lakes via the Illinois River, and the improved channel from St. Louis to the gulf, the Middle West will be put into direct communication with the cities of the Pacific Coast as well as with those of Hawaii, the Philippines, Japan, China, and western South America. A saving of between 8,700 to 8,946 miles will be made between Chicago and San Francisco and Asiatic ports via the Mississippi and the Panama Canal. The central part of the Middle West will be 590 miles nearer San Francisco and other Pacific ports than New York. The people of South America are already purchasers in United States to the extent of \$40,000,000

³²Hearings on Rail. Rates, p. 498.

³³*Ibid.*

³⁴*Ibid.* p. 493.

³⁵*Ibid.* p. 505.

a year, and a great share of this is from the Middle West. Every effort is being made to secure more of this trade at the expense of Germany.

When direct water communications are established between the Mississippi and South and Central America so that vessels loaded at South American ports can, without breaking bulk, discharge their cargoes at ports on the upper Mississippi or the Great Lakes, an inestimable increase in the trade of the Central West will occur.

Summary

Some idea of the magnitude of the difficulties involved in the improvement of the Mississippi has been given. The necessity of awaiting for full reports and estimates before inaugurating the greater projects has been shown. Sufficient evidence has been presented, however, to establish the fact that the improvements will be of great value. Added emphasis is given to this when the congestion of freight in all parts of the country in 1906 is recalled. James J. Hill asserted that it would take 73,333 miles of railroads, constructed during the ensuing five years, and costing \$5,500,000,000 to relieve the situation. Railroad corporations have since met with such difficulties in securing capital during the past two years as to delay even modest extensions of their lines. Relief can come only by the government's undertaking a national system of improvement of its navigable waters. It is the best way that can be adopted for further regulating rail rates and assisting in extending the transportation facilities of the country.

As a business proposition it will pay great returns if the rivers are made freight carriers and rate regulators.⁸⁶ The census report of 1900 states that the cost of transportation on all railroads of the United States averaged 7.5 mills per ton per mile, on the Ohio River to Cincinnati .32 mill, and on the lower Mississippi .1 mill. If James J. Hill's statement be correct that railroad transportation cannot be performed at much less than one-half cent a ton per mile while by steel barge freight can be carried on a deep channeled river at the cost of one mill, then water navigation will continue the cheapest for a large class of commodities.

⁸⁶Cong. Records 41, p. 2289. Speech of Joseph E. Ransdell in House of Representatives, January 31, 1907.

But the friends of the Mississippi River improvements must remember that similar arguments are at present being advanced for the improvement of many other rivers in the country.⁸⁷ Every effort must be made to intensify the spirit of co-operation which has exhibited itself in recent conventions. A solid majority must be secured in the next Congress in favor of much larger appropriations for the various meritorious projects, and the work must be inaugurated upon a broad national basis which will make adequate provisions for improvements in every section of the country or failure will result. In that event the Panama Canal even will not enable us to maintain our commercial position among the nations of the world.

⁸⁷See Debates on recent River and Harbor Appropriation Bill in Cong. Records 41, also Proceedings of National Rivers and Harbors Congress, 1906.